

This activity will help your students to see why Venus appears to us sometimes as the morning “star” and sometimes as the evening “star.”

## **Morning Star and Evening Star**

### **Materials**

- A white light with no shade or reflector. This will represent the Sun.
- A small white ball to represent Venus. Mount the ball on a stick or pencil.
- A way to make the Venus stick stand up. It could be stuck into a lump of clay, or taped to the edge of the table.

### **Preparation**

Set up the white light on a table in the front of the class. Make sure there is room for you to move the “Venus” ball in a small orbit (less than one meter radius) around the “Sun.”

### **In Class**

*Turn on the white light and turn off the room lights.*

Let’s pretend that this bright white light is the Sun, the small white ball is the planet Venus, and your head is the Earth.

*Since your head is the Earth, you can imagine people living on “Mt. Nose.” What time of day is it on Mt. Nose when you look directly toward the Sun? [Noon.] What time of day is it when you are facing directly away from the Sun? [Midnight.]*

*Put your hands up to form blinders on the sides of your eyes. [Demonstrate, as shown in the picture.]*

Your hands form an eastern horizon and a western horizon.

*Now, turn around to face directly away from the Sun, and then start turning slowly to your left.*

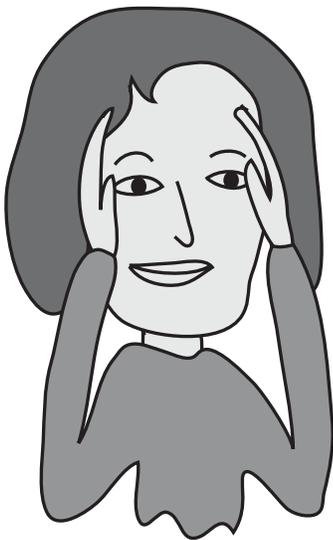
This is the way the Earth turns. You should see the “Sun” during your day. It is night when the Sun “sets” behind your (western) horizon hand and you are facing away from the Sun. When the Sun “rises” from your other (eastern) horizon hand it’s morning.

*Behind which hand does your Sun “set,” the left hand or the right? [Right.]*

*For younger groups, stop and make sure students recall which hand is their right by asking them all to raise their right hands. Help any students who have trouble recalling.*

*On which horizon does the Sun set, the West or the East? [West.] Which of your horizon hands represents your western horizon, your left hand or your right hand? [Right hand.] Turn a couple more times slowly so you see the Sun rise and set a couple more times, and then stop at your “noon” position facing the Sun and rest your “horizons.” You may put your hands down.*

*Hold the white Venus ball about 1/2 meter to the right of the Sun (as seen by your students).*



Now we will add Venus to our model. This white ball is Venus. As you turn, you will see Venus and the Sun. When the real Sun is above the horizon, it is so bright that it is very difficult for you to see the real Venus. So in our model, imagine you can see Venus only when the Sun is below the horizon (behind your hand or behind your head). Venus will be visible to you just before sunrise, just after sunset, or it won't be visible to you at all.

*Now, put your horizons back on and start turning slowly to find out if you can see Venus just before your sunrise, or just after your sunset.*

Let the students turn a few times.

*Raise your hand if you saw Venus just before sunrise. [Most of the students will raise their hands.] If you saw Venus just before sunrise, would you call it the "morning star" or the "evening star?" [Morning star.] Turn around a couple of more times to make sure you can see the "morning star" just before "sunrise." (Help any students who need help.) Now stop turning and rest your "horizons."*

Venus orbits around the Sun and so can appear to be on either side of the Sun.

*Make Venus orbit the Sun and finally, put Venus on the other side of the Sun, on the left side from your students' perspective.*

*If you put up your "horizon" hands and let your "Earth" turn again, do you think you will be able to see Venus before sunrise or after sunset? [After sunset.] Try it. Raise your hand if you saw Venus just after sunset. [Most of the students will raise their hands.] Was Venus a morning star or evening star for you? [Evening star.] Turn around a couple more times to make sure you can see the "Evening Star" just after "sunset."*

Help any students who need help.

*Do you think that there is any time when you cannot see Venus at all? [Yes.] When would you not be able to see Venus? [When Venus is either behind the Sun and blocked or in front of the Sun and is drowned out by the sun's brightness.]*

Walk around the Sun with Venus to show its orbit. While you are orbiting the Sun . . .

*Raise your hand if Venus is not visible to you because it is behind the Sun.*

Go around for at least two orbits.

*Now raise your hand when Venus would not be visible to you because it is in front of the Sun, and the sun's brightness would hide it. [Remember, the real Sun is much brighter than this light!]*

Go around another two orbits or so.

What you have just modeled is the modern explanation for why Venus is sometimes the "evening star," sometimes the "morning star," and sometimes not visible at all.

### Optional

Venus's cycle is as follows:

1. Venus appears as a morning star for about 263 days.
2. Venus is not visible when it goes behind the Sun for about 50 days.
3. Venus appears as the evening star for about 263 days.
4. Venus is not visible when it goes in front of the Sun for about 8 days.
5. The entire cycle of Venus is 584 days long.

**Why do you think that Venus's time of non-visibility is longer when it goes behind the Sun than when it goes in front of the Sun?**

A diagram helps to answer this question:

